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A Disturbed Region in the Corona of January 3, 1908.

In his study of the solar corona of April, 1893, as photographed by the Phoebe A. Hearst Expedition from the Lick Observatory to Chile, Professor Schaeberle was led to the conclusion that the inner ends of the coronal streamers coincide in position with disturbed areas in the photosphere of the Sun. Tracing the streamers inward to the Sun's surface he located six chief centers of origin. On comparing these results, obtained from the coronal image alone, with the photographic record of the uneclipsed Sun made by Professor Hale in Chicago on the day of the eclipse, Professor Schaeberle noted an agreement between the points determined by him and the disturbed areas shown on the photograph of the uneclipsed Sun. From a study of his and previous coronal photographs he concluded that the origins of the coronal streamers are, in the main, confined to the spot-zone regions. [See *Contributions from the Lick Observatory,* No. 4, pp. 108-113.]

In *Lick Observatory Bulletin,* Nos. 9 and 18, Dr. Perrine, in charge of the Crocker Eclipse Expedition to Sumatra in 1901, described an area [in space a volume] of unusual disturbance recorded on his photographs of the corona. A number of streamers appeared to radiate from a common point, situated behind the Moon, as if thrown out by an explosion at the point, though it was not contended or suggested that an explosion had actually occurred. On comparing the estimated position of the invisible vertex with photographs of the uneclipsed Sun obtained at Dehra Dun, India, on the day of the eclipse and on several days preceding and following the eclipse, it was found that the apex of the disturbance was apparently coincident with the large and only sun-spot shown on the entire series of Sun photographs. It was impossible to doubt that the coronal disturbance was intimately connected with the sun-spot.

The large-scale photographs of the corona of August 30, 1905, secured by the Crocker Expeditions to Spain and Egypt likewise showed an extensive region in the southeast quadrant composed of prominent streamers which appear to radiate from a common point. The apex of the cone of disturbance projected upon the photographic plate is some distance within the Sun's limb. The apex was, no doubt, near the photosphere.

The estimated position of the vertex on this occasion fell fairly near, but not in coincidence with, a prominent sun-spot shown on photographs taken at Mt. Hamilton on the day of the eclipse. Tracing the position of the spot back through one revolution of the Sun, it was found that the sun-spot was on August 3d in the estimated position of the vertex. Just what weight should be given to this observation, as related to the question of a close connection between coronal structure and sun-spots, is uncertain. The detailed measurements are published in *Lick Observatory Bulletin,* No. 115.

Lick Observatory Bulletin, No. 131, which was sent to the printer several months ago and is now ready for mailing, describes briefly a similar cone of disturbance in the corona observed by us on the Flint Island photographs of January 3, 1908. Recent careful measures of the position of the vertex place it at

Position angle,	75°.0 E. of N.
Distance from Sun's center,	13′.7

It should be said that the disturbance, while on a very large scale, does not fix the position of the vertex so definitely as in the case of the 1901 disturbance, as the streamers seem to radiate from a small area or perhaps from several points near each other.

The photoheliograph camera of the Lick Observatory was dismounted in the fall of 1907 to make way for the new fireproof building, and photographs of the Sun at and near the time of the eclipse could not be secured here. At our request, Director HALE of the Mt. Wilson Solar Observatory most kindly supplied the deficiency by loaning photographs of the uneclipsed Sun taken on January 3, 4, and 5, 1908. There was a region of great apparent disturbance near the east limb, in north latitude 10° ±, shown especially well on a spectroheliograph H_1 negative. This region contains five or more sun-spots within a few degrees of each other. From the position of the Sun's equator marked on the back of the photograph by Professor HALE, combined with the angle between the equator and the east and west line, we have measured the positions of the chief spots of the group for the time of total eclipse, referred to the Sun's center, as follows:—

Position Angles.	Distance.
71°.8 E. of N.	13′.4
77 .9	13 .2
77 .5	14 .8
80 .5	14 .2
82 .0	14 .8

The estimated position of the vertex falls within the spot group; and it is scarcely possible to doubt that the disturbance in or near the photosphere is intimately related to the disturbed conical volume of the corona. Whether the coronal and photospheric disturbances are related to each other as cause and effect, or, more probably, as joint effects of a more general cause, is not known.

The subject takes on renewed interest in view of Professor HALE's recent discovery of cyclonic motion or vortices in sun-spots and surrounding regions.

W. W. CAMPBELL,
S. ALBRECHT.

1908 July 31.

FLINT ISLAND CORONA.

In No. 119 of these *Publications* appeared half-tone illustrations of the solar corona from photographs made by the Crocker Expedition to Flint Island.

In No. 120 I called attention to the fact that the prints supplied by an Eastern engraver and printer were inferior to the proof-sheets of the illustrations, and that the printer had made an error in orienting the smaller coronal subject. In view of these facts, acknowledged by the engraver, new prints of the two subjects have been supplied by him. They are distributed with the present copy, No. 121. It is advised that members insert them in No. 119 to replace the poorer prints.

There is perhaps no astronomical subject more difficult to reproduce by mechanical process than the solar corona, and it is necessary to recognize that in the best half-tone reproductions the delicate details of structure and the minute differences of intensity are almost wholly lost. In view of the